Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Neonatal blood stream infection: percentage of discharges with healthcare-associated bloodstream infection per 1,000 discharges for newborns and outborns with birth weight of 500 grams or more but less than 1,500 grams; with gestational age between 24 and 30 weeks; or with birth weight of 1,500 grams or more and death, an operating room procedure, mechanical ventilation, or transferring from another hospital within two days of birth.

Source(s)

AHRQ QI research version 5.0. Neonatal quality indicator 3 technical specifications: neonatal blood stream infection rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 3 p.

National Quality Forum measure information: neonatal blood stream infection rate (NQI 3). Washington (DC): National Quality Forum (NQF); 2014 Jan 2. 14 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of discharges with healthcare-associated bloodstream infection per 1,000 discharges for newborns and outborns with birth weight of 500 grams or more but less than 1,500 grams; with gestational age between 24 and 30 weeks; or with birth weight of 1,500 grams or more and death, an operating room procedure, mechanical ventilation, or transferring from another hospital within two days of birth.

Rationale

Health care-associated bacteremia is a significant problem for infants admitted into neonatal intensive care units (NICUs) and other hospital units. This is especially true for very low birth weight infants who are at high risk for these infections due to their immature immune systems and need for invasive monitoring and supportive care (Adams-Chapman & Stoll, 2002; Bloom et al., 2003; Clark et al., "Prevention," 2004; Clark et al., "Nosocomial," 2004; Gaynes et al., 1996; Payne et al., 2004; Sohn et al., 2001; Stoll et al., 2002). Reported health care-associated infection rates range from 6% to 33%, but the rate varies widely among different centers (Adams-Chapman & Stoll, 2002; Bloom et al., 2003; Clark et al., "Nosocomial," 2004; Sohn et al., 2001; Stoll et al., 2002). Mortality rates are high and infections result in increased length of stay as well as increased hospital costs and charges (Adams-Chapman & Stoll, 2002; Bloom et al., 2003; Clark et al., "Nosocomial," 2004; Horbar et al., 2001; Kilbride et al., "Implementation," 2003; Sohn et al., 2001; Stoll et al., 2002).

Effective preventive measures range from simple hand-washing protocols or closed medication delivery systems to more elaborate multidisciplinary quality improvement plans involving hand-washing, nutrition, skin care, respiratory care, vascular access, and diagnostic practices. All of these interventions have been shown to substantially reduce infection rates, albeit in nonrandomized studies using historical or concurrent control units (Adams-Chapman & Stoll, 2002; Aly et al., 2005; Bloom et al., 2003; Clark et al., "Prevention," 2004; Clark et al., "Nosocomial," 2004; Horbar et al., 2001; Lam, Lee, & Lau, 2004; Kilbride et al., "Implementation," 2003; Kilbride et al., "Evaluation," 2003; Ng et al., 2004; Schelonka et al., 2006). For example, six Vermont Oxford Network NICUs reduced their rates of coagulase-negative staphylococcus infections from 22.0% in 1994 to 16.6% in 1996 after implementing a quality improvement model (versus a much smaller decrease from 15.4% to 14.5% at 66 comparison NICUs) (Horbar et al., 2001). A similar reduction from 24.6% to 16.4% was achieved with a multi-modality, multi-hospital intervention focusing on hand hygiene with an effective agent before and after every patient contact, eliminating hand jewelry and artificial nails, using maximal barrier precautions during central venous catheter insertion, decreasing the number of skin punctures, reducing the duration of intravenous lipid and deep line use, and improving the diagnosis of health care-associated infections. (Kilbride et al., "Implementation," 2003; Kilbride et al., "Evaluation," 2003).

This measure is intended to identify adverse events of bloodstream infection that occur in the hospitalization of interest and may be prevented through improved processes or structures of care.

Evidence for Rationale

Adams-Chapman I, Stoll BJ. Prevention of nosocomial infections in the neonatal intensive care unit. Curr Opin Pediatr. 2002 Apr;14(2):157-64. [80 references] PubMed

Aly H, Herson V, Duncan A, Herr J, Bender J, Patel K, El-Mohandes AA. Is bloodstream infection preventable among premature infants? A tale of two cities. Pediatrics. 2005 Jun;115(6):1513-8. PubMed

Bloom BT, Craddock A, Delmore PM, Kurlinski JP, Voelker M, Landfish N, Rodriguez-Pierce M, Swanton D, Rossi J, Ehlen J, Harmon C, Deterding J, Houser F. Reducing acquired infections in the NICU: observing and implementing meaningful differences in process between high and low acquired infection rate centers. J Perinatol. 2003 Sep;23(6):489-92. PubMed

Clark R, Powers R, White R, Bloom B, Sanchez P, Benjamin DK Jr. Nosocomial infection in the NICU: a medical complication or unavoidable problem. J Perinatol. 2004 Jun;24(6):382-8. [100 references] PubMed

Clark R, Powers R, White R, Bloom B, Sanchez P, Benjamin DK Jr. Prevention and treatment of nosocomial sepsis in the NICU. J Perinatol. 2004 Jul;24(7):446-53. [139 references] PubMed

Gaynes RP, Edwards JR, Jarvis WR, Culver DH, Tolson JS, Martone WJ. Nosocomial infections among neonates in high-risk nurseries in the United States. National Nosocomial Infections Surveillance System. Pediatrics. 1996 Sep;98(3 Pt 1):357-61. PubMed

Horbar JD, Rogowski J, Plsek PE, Delmore P, Edwards WH, Hocker J, Kantak AD, Lewallen P, Lewis W, Lewit E, McCarroll CJ, Mujsce D, Payne NR, Shiono P, Soll RF, Leahy K, Carpenter JH. Collaborative quality improvement for neonatal intensive care. NIC/Q Project Investigators of the Vermont Oxford Network. Pediatrics. 2001 Jan;107(1):14-22. PubMed

Kilbride HW, Powers R, Wirtschafter DD, Sheehan MB, Charsha DS, LaCorte M, Finer N, Goldmann DA. Evaluation and development of potentially better practices to prevent neonatal nosocomial bacteremia. Pediatrics. 2003 Apr;111(4 Pt 2):e504-18. PubMed

Kilbride HW, Wirtschafter DD, Powers RJ, Sheehan MB. Implementation of evidence-based potentially better practices to decrease nosocomial infections. Pediatrics. 2003 Apr;111(4 Pt 2):e519-33. PubMed

Lam BC, Lee J, Lau YL. Hand hygiene practices in a neonatal intensive care unit: a multimodal intervention and impact on nosocomial infection. Pediatrics. 2004 Nov;114(5):e565-71. PubMed

National Quality Forum measure information: neonatal blood stream infection rate (NQI 3). Washington (DC): National Quality Forum (NQF); 2014 Jan 2. 14 p.

Ng PC, Wong HL, Lyon DJ, So KW, Liu F, Lam RK, Wong E, Cheng AF, Fok TF. Combined use of alcohol hand rub and gloves reduces the incidence of late onset infection in very low birthweight infants. Arch Dis Child Fetal Neonatal Ed. 2004 Jul;89(4):F336-40. PubMed

Payne NR, Carpenter JH, Badger GJ, Horbar JD, Rogowski J. Marginal increase in cost and excess length of stay associated with nosocomial bloodstream infections in surviving very low birth weight infants. Pediatrics. 2004 Aug;114(2):348-55. PubMed

Schelonka RL, Scruggs S, Nichols K, Dimmitt RA, Carlo WA. Sustained reductions in neonatal nosocomial infection rates following a comprehensive infection control intervention. J Perinatol. 2006 Mar;26(3):176-9. PubMed

Sohn AH, Garrett DO, Sinkowitz-Cochran RL, Grohskopf LA, Levine GL, Stover BH, Siegel JD, Jarvis WR, Pediatric Prevention Network. Prevalence of nosocomial infections in neonatal intensive care unit patients: Results from the first national point-prevalence survey. J Pediatr. 2001 Dec;139(6):821-7. PubMed

Stoll BJ, Hansen N, Fanaroff AA, Wright LL, Carlo WA, Ehrenkranz RA, Lemons JA, Donovan EF, Stark AR, Tyson JE, Oh W, Bauer CR, Korones SB, Shankaran S, Laptook AR, Stevenson DK, Papile LA, Poole WK. Late-onset sepsis in very low birth weight neonates: the experience of the NICHD Neonatal Research Network. Pediatrics. 2002 Aug;110(2 Pt 1):285-91. PubMed

Primary Health Components

Blood stream infection; septicemia; bacteremia; staphylococcal or Gram-negative bacterial infection; newborns; outborns

Denominator Description

All newborns and outborns with either:

A birth weight of 500 to 1,499 grams (Birth Weight Categories 2, 3, 4 and 5); or
Any-listed International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for gestational age between 24 and 30 weeks; or
A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and death (DISP=20); or
A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and any-listed ICD-9-CM procedure codes for operating room procedure; or
A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and any-listed ICD-9-CM procedure codes for mechanical ventilation; or
A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and transferring from another health care facility within two days of birth

See the related "Denominator Inclusions/Exclusions" field.

Numerator Description

Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with either:

Any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for other septicemia; or
Any secondary ICD-9-CM diagnosis codes for newborn septicemia or bacteremia and any secondary ICD-9-CM diagnosis codes for staphylococcal or Gram-negative bacterial infection

See the related "Numerator Inclusions/Exclusions" field.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

- In the 2008 State Inpatient Data (SID) there were 5,090 bloodstream infection events out of 106,899 high risk newborns, for a rate of 46.7 per 1,000. Approximately 47% of these events are coded as NOT present on admission.
- The incidence of health care-associated bacteremia increases with decreasing birth weight. Other risk factors include central venous catheter use, prolonged time using parenteral nutrition, prolonged time on mechanical ventilation, use of H2-blocking agents, and overcrowding or heavy staff loads (Adams-Chapman & Stoll, 2002; Barton, Hodgman, & Pavlova, 1999; Gaynes et al., 1996; Stoll et al., 2002). The most common causative organisms are coagulase-negative staphylococci, Staphylococcus aureus, enterococci, Enterobacter sp, and Escherichia coli (Adams-Chapman & Stoll, 2002; Clark et al., 2004; Gaynes et al., 1996; Horbar et al., 2001; Payne et al., 2004; Sohn et al., 2001; Stoll et al., 2002).

Evidence for Additional Information Supporting Need for the Measure

Adams-Chapman I, Stoll BJ. Prevention of nosocomial infections in the neonatal intensive care unit. Curr Opin Pediatr. 2002 Apr;14(2):157-64. [80 references] PubMed

Barton L, Hodgman JE, Pavlova Z. Causes of death in the extremely low birth weight infant. Pediatrics. 1999 Feb;103(2):446-51. PubMed

Clark R, Powers R, White R, Bloom B, Sanchez P, Benjamin DK Jr. Nosocomial infection in the NICU: a medical complication or unavoidable problem. J Perinatol. 2004 Jun;24(6):382-8. [100 references] PubMed

Gaynes RP, Edwards JR, Jarvis WR, Culver DH, Tolson JS, Martone WJ. Nosocomial infections among neonates in high-risk nurseries in the United States. National Nosocomial Infections Surveillance System. Pediatrics. 1996 Sep;98(3 Pt 1):357-61. PubMed

Horbar JD, Rogowski J, Plsek PE, Delmore P, Edwards WH, Hocker J, Kantak AD, Lewallen P, Lewis W, Lewit E, McCarroll CJ, Mujsce D, Payne NR, Shiono P, Soll RF, Leahy K, Carpenter JH. Collaborative quality improvement for neonatal intensive care. NIC/Q Project Investigators of the Vermont Oxford Network. Pediatrics. 2001 Jan;107(1):14-22. PubMed

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Payne NR, Carpenter JH, Badger GJ, Horbar JD, Rogowski J. Marginal increase in cost and excess length of stay associated with nosocomial bloodstream infections in surviving very low birth weight infants. Pediatrics. 2004 Aug;114(2):348-55. PubMed

Sohn AH, Garrett DO, Sinkowitz-Cochran RL, Grohskopf LA, Levine GL, Stover BH, Siegel JD, Jarvis WR, Pediatric Prevention Network. Prevalence of nosocomial infections in neonatal intensive care unit patients: Results from the first national point-prevalence survey. J Pediatr. 2001 Dec;139(6):821-7. PubMed

Stoll BJ, Hansen N, Fanaroff AA, Wright LL, Carlo WA, Ehrenkranz RA, Lemons JA, Donovan EF, Stark AR, Tyson JE, Oh W, Bauer CR, Korones SB, Shankaran S, Laptook AR, Stevenson DK, Papile LA, Poole WK. Late-onset sepsis in very low birth weight neonates: the experience of the NICHD Neonatal Research Network. Pediatrics. 2002 Aug;110(2 Pt 1):285-91. PubMed

Extent of Measure Testing

Reliability Testing

Data/Sample. Includes approximately 6 million pediatric discharges for 2,500 hospitals ("Healthcare Cost and Utilization Project [HCUP] State Inpatient Databases [SID]," 2008).

Analytic Method. The signal to noise ratio is the ratio of the between hospital variance (signal) to the within hospital variance (noise). The formula is signal / (signal + noise). The ratio itself is only a diagnostic for the degree of variance in the risk-adjusted rate systematically associated with the provider. Therefore, what matters is the magnitude of the variance in the "smoothed" rate (that is, the variance in the risk-adjusted rate after the application of the univariate shrinkage estimator based on the signal ratio).

Testing Results. Updated testing results including both benign and malignant cases:

What the data demonstrate is systematic variation in the provider level rate of 0.419 to 69.167 per 1,000 from the 5th to 95th percentile after a signal ratio of 0.831 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

Validity Testing

Data/Sample. See the HCUP Kids' Inpatient Database (KID) Web site

("Healthcare Cost and Utilization Project [HCUP] Kids' Inpatient Database [KID]," 2000; "HCUP KID," 2003).

Analytic Method. A structured panel review of each indicator was undertaken to evaluate the face validity (from a clinical perspective) of the indicator. Specifically, the panels approach sought to establish consensual validity, which "extends face validity from one expert to a panel of experts who examine and rate the appropriateness of each item…." The methodology for the structured review was adapted from the RAND/UCLA Appropriateness Method and consisted of an initial independent assessment of each indicator by clinician panelists using an initial questionnaire, a conference call among all panelists, followed by a final independent assessment by clinician panelists using the same questionnaire. The panel process served to refine definitions of some indicators, add new measures, and dismiss indicators with major concerns from further consideration.

Testing Results. The multi-specialty Panel rated the indicator as acceptable on overall usefulness as an indicator of potentially preventable complications of care.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2000.

Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2003.

Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2008.

National Quality Forum measure information: neonatal blood stream infection rate (NQI 3). Washington (DC): National Quality Forum (NQF); 2014 Jan 2. 14 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age 24 to 30 weeks

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Therapeutic Intervention

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
All newborns and outborns with either:

- A birth weight of 500 to 1,499 grams (Birth Weight Categories 2, 3, 4 and 5); or
- Any-listed International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for gestational age between 24 and 30 weeks; or
- A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and death (DISP=20); or
- A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and any-listed ICD-9-CM procedure codes for operating room procedure; or
- A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and any-listed ICD-9-CM procedure codes for mechanical ventilation; or
- A birth weight greater than or equal to 1,500 grams (Birth Weight Category 6, 7, 8, or 9) and transferring from another health care facility within two days of birth

Note: Refer to the original measure documentation for ICD-9-CM codes. See also the *Pediatric Quality Indicators Appendices*.

Exclusions
Exclude cases:

- With a principal ICD-9-CM diagnosis code (or secondary diagnosis present on admission*) for sepsis
- With a principal ICD-9-CM diagnosis code (or secondary diagnosis present on admission*) for sepsis or bacteremia
- With a principal ICD-9-CM diagnosis code (or secondary diagnosis present on admission*) for staphylococcal or Gram-negative bacterial infection
- With birth weight less than 500 grams (Birth Weight Category 1)
- With length of stay less than 7 days
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year

(YEAR=missing) or principal diagnosis (DX1=missing)

*Only for cases that otherwise qualify for the numerator.

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with either:

- Any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for other septicemia; or
- Any secondary ICD-9-CM diagnosis codes for newborn septicemia or bacteremia and any secondary ICD-9-CM diagnosis codes for staphylococcal or Gram-negative bacterial infection

Note: Refer to the original measure documentation for ICD-9-CM codes.

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Adverse Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, birthweight (500g groups), modified Centers for Medicare and Medicaid Services (CMS) Diagnosis-Related Group (DRG), congenital anomalies, transfer-in status and the availability of point of origin. The specific covariates retained in the model for this measure are listed in the original measure documentation. The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2010, a database consisting of 43 states and approximately 6 million pediatric discharges. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Refer to the original measure documentation for the specific covariates for this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

NQI 3: neonatal blood stream infection rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Pediatric Quality Indicators

Measure Subset Name

Neonatal Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2015 Jan 5

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ QI. Neonatal quality indicators #3: technical specifications. Neonatal blood stream infection rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 2 p.
AHRQ quality indicators. Pediatric quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 61 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site.

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Pediatric quality indicators (PDI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 98 p. This document is available from the AHRQ Quality Indicators Web site.
ARHQ quality indicators. Pediatric quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 13 p. This document is available from the AHRQ Quality Indicators Web site
AHRQ quality indicators. Pediatric quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available in PDF from the AHRQ Quality Indicators Web site.
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site.

NQMC Status

This NQMC summary was completed by ECRI Institute on June 30, 2010.

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Copyright Statement

Production

Source(s)

AHRQ QI research version 5.0. Neonatal quality indicator 3 technical specifications: neonatal blood stream infection rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 3 p.

National Quality Forum measure information: neonatal blood stream infection rate (NQI 3). Washington (DC): National Quality Forum (NQF); 2014 Jan 2. 14 p.

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